

WHAT IS CLAIMED IS:

1. A data transmission method for communication between first and second transmission devices transmitting/receiving a data frame by using a single transmission path, comprising the steps of:

5 detecting, at said first transmission device, that a carrier used for signal transmission of the data frame does not exist on said transmission path for confirming that said transmission path is available,

transmitting one or more data frames in sequence from said
10 first transmission device when said carrier does not exist,

detecting, at said second transmission device, that said carrier does not exist on said transmission path for confirming that said transmission path is available when received one or more of the data frames transmitted from said first transmission device,
15 and

transmitting one or more data frames in sequence from said second transmission device when said carrier does not exist.

2. A data transmission method for communication between first and second transmission devices transmitting/receiving a data frame via a relay device by using a single transmission path, comprising the steps of:

5 detecting, at said relay device, when received one or more

data frames transmitted from said first transmission device, an error in each of the received data frames;

setting, at said relay device, only the data frame in which no error was detected as a data frame to be transmitted,

10 detecting, at said relay device, that said carrier does not exist on said transmission path for confirming that said transmission path is available; and

transmitting one or more data frames in sequence from said relay device to said second transmission device when said carrier
15 does not exist.

3. A data transmission method for communication between first and second transmission devices transmitting/receiving a data frame including a transmission timer value indicating a total frame time of data frames subsequent thereto by using a single
5 transmission path, comprising the steps of:

sequentially transmitting n-data-frames (where n is an arbitrary natural number) each including the transmission timer value set to indicate (n - k) frame time (where k is an arbitrary natural number showing sequential order of transmission) from
10 said first transmission device;

detecting, at said second transmission device that has received one or more of the data frames each ^{said frame} including said transmission timer value, the transmission timer value included in an error-free data frame among the received data frames;

15 managing, at said second transmission device, an elapse of
the total frame time of the subsequent data frames by using the
detected transmission timer value and managing an elapse of a time
period by using a predetermined initial value when no transmission
timer value is detected, for confirming that said transmission
20 path is available; and

transmitting one or more data frames in sequence from said
second transmission device when said transmission path is
confirmed being available.

4. The data transmission method according to claim 3,
wherein

said transmission path is implemented by radio transmission
in an arbitrary frequency band.

5. The data transmission method according to claim 3,
wherein

said initial value is determined as the maximum time
required for error-free transmission of all of said data frames.

6. The data transmission method according to claim 3,
wherein

in said step of detecting said transmission timer value,
the transmission timer value is detected from every error-free
5 data frame among the data frames received by said second

transmission device; and

in said step of confirming that said transmission path is available, an elapse of the total frame time of the subsequent data frames is started to be managed every time said transmission
10 timer value is detected.

7. A data transmission method for communication between first and second transmission devices transmitting/receiving a data frame including a transmission timer value indicating a total frame time of data frames subsequent thereto via a relay device
5 by using a single transmission path, comprising the steps of:

sequentially transmitting n-data-frames (where n is an arbitrary natural number) each including the transmission timer value set to indicate (n - k) frame time (where k is an arbitrary natural number showing sequential order of transmission) from said
10 first transmission device;

detecting, at said relay device that has received one or more of the data frames each including said transmission timer value, an error in each of the received data frames;

detecting, at said relay device, the transmission timer
15 value included in an error-free data frame among the received data frames;

setting, at said relay device, m-data frames (where m is a natural number not more than n) in which no error was detected as data frames to be transmitted;

20 setting, at said relay device, the transmission timer value
for each of the data frames set as the data frames to be transmitted
so as to indicate $(m - k)$ frame time;

 managing, at said relay device, an elapse of the total frame
time of the subsequent data frames by using the detected
25 transmission timer value for confirming that said transmission
path is available; and

 transmitting one or more data frames in sequence from said
relay device to said second transmission device when said
transmission path is confirmed being available.

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 8. The data transmission method according to claim 7,
wherein

 said transmission path is implemented by radio transmission
in an arbitrary frequency band.

 9. The data transmission method according to claim 7,
wherein

 in said step of detecting said transmission timer value,
the transmission timer value is detected from every error-free
5 data frame among the data frames received by said relay device;
and

 in said step of confirming that said transmission path is
available, an elapse of the total frame time of the subsequent
data frames is started to be managed every time said transmission

10 timer value is detected.

10. A data transmission system for communication between first and second transmission devices transmitting/receiving a data frame by using a single transmission path, wherein

said first and second transmission devices each comprise:

5 a receiving portion for receiving the data frame;

a carrier detecting portion for detecting that a carrier used for signal transmission of the data frame does not exist on said transmission path; and

10 a transmitting portion for transmitting the data frame, and

said second transmission device that has received one or more of the data frames transmitted from said first transmission device detects, by said carrier detecting portion provided therein, that the carrier does not exist on said transmission path
15 to confirm that said transmission path is available, and then transmits one or more data frames in sequence.

11. A data transmission system for communication between first and second transmission devices transmitting/receiving a data frame via a relay device by using a single transmission path, wherein

5 said first and second transmission devices each comprise:

a first receiving portion for receiving the data

frame;

a first carrier detecting portion for detecting that
a carrier used for signal transmission of the data frame does not
10 exist on said transmission path; and

a first transmitting portion for transmitting the
data frame,

said relay device comprises:

a second receiving portion for receiving the data
15 frame;

a second carrier detecting portion for detecting that
the carrier used for signal transmission of the data frame does
not exist on said transmission path;

an error detecting portion for detecting an error in
20 the data frame received by said second receiving portion;

a received frame analyzing portion for setting the
data frame in which no error was detected by said error detecting
portion as a data frame to be transmitted; and

a second transmitting portion for transmitting the
25 data frame, and

said relay device, when received one or more of the data
frames transmitted from said first transmission device, detects,
by said second carrier detecting portion provided therein, that
the carrier does not exist on said transmission path to confirm
30 that said transmission path is available, and then transmits one
or more of said data frames to be transmitted to said second

transmission device in sequence.

12. A data transmission system for communication between first and second transmission devices transmitting/receiving a data frame including a transmission timer value indicating a total frame time of data frames subsequent thereto by using a single
5 transmission path, wherein

said first and second transmission devices each comprise:

a receiving portion for receiving the data frame including said transmission timer value;

a transmission timer acquiring portion for acquiring
10 the transmission timer value included in the data frame received by said receiving portion;

a transmission timer for suspending transmission for a frame time indicated by the transmission timer value acquired by said transmission timer acquiring portion, and when none of
15 said timer values is acquired, suspending transmission for a time indicated by a predetermined initial value;

a transmitting frame constructing portion for constructing a data frame to be transmitted including the transmission timer value so set as to indicate the total frame
20 time of the data frames subsequent thereto; and

a transmitting portion for transmitting the data frame to be transmitted constructed by said transmitting frame constructing portion, and

25 said second transmission device, when received one or more
of the data frames transmitted from said first transmission device,
confirms, by said transmission timer provided therein, that said
transmission path is available through an elapse of the time of
suspending transmission, and then transmits one or more of the
data frames to be transmitted constructed by said transmitting
30 frame constructing portion in sequence.

13. The data transmission system according to claim 12,
wherein

said transmission path is implemented by radio transmission
in an arbitrary frequency band.

14. The data transmission system according to claim 12,
wherein

said initial value is determined as the maximum time
required for error-free transmission of all of said data frames.

15. A data transmission system for communication between
first and second transmission devices transmitting/receiving a
data frame including a transmission timer value indicating a total
frame time of data frames subsequent thereto via a relay device
5 by using a single transmission path, wherein

said first and second transmission devices each comprise:

a first receiving portion for receiving the data

frame including said transmission timer value;

10 a first transmission timer acquiring portion for
acquiring the transmission timer value included in the data frame
received by said first receiving portion;

15 a first transmission timer for suspending
transmission for a frame time indicated by the transmission timer
value acquired by said first transmission timer acquiring portion,
and when none of said timer values is acquired, suspending
transmission for a time indicated by a predetermined initial
value;

20 a first transmitting frame constructing portion for
constructing a data frame to be transmitted including the
transmission timer value so set as to indicate the total frame
time of data frames subsequent thereto; and

 a first transmitting portion for transmitting the
data frame to be transmitted constructed by said first
transmitting frame constructing portion,

25 said relay device comprises:

 a second receiving portion for receiving the data
frame including said transmission timer value;

 an error detecting portion for detecting an error in
the data frame received by said second receiving portion;

30 a received frame analyzing portion for setting the
data frame in which no error was detected by said error detecting
portion as a data frame to be transmitted;

a second transmission timer acquiring portion for acquiring the transmission timer value included in an error-free data frame among the received data frames;

a second transmission timer for suspending transmission for a frame time indicated by the transmission timer value acquired by said second transmission timer acquiring portion,

a second transmitting frame constructing portion for constructing a data frame to be transmitted including the transmission timer value so set as to indicate the total frame time of the data frames subsequent thereto; and

a second transmitting portion for transmitting the data frame to be transmitted constructed by said second transmitting frame constructing portion, and

said relay device, when received one or more of the data frames transmitted from said first transmission device, confirms, by said second transmission timer provided therein, that said transmission path is available through an elapse of the time of suspending transmission, and then transmits one or more of the data frames to be transmitted constructed by said second transmitting frame constructing portion to said second transmission device in sequence.

16. The data transmission system according to claim 15, wherein

said transmission path is implemented by radio transmission in an arbitrary frequency band.

17. A transmission device for transmitting/receiving a data frame by using a single transmission path, comprising:

a receiving portion for receiving the data frame;

a carrier detecting portion for detecting that a
5 carrier used for signal transmission of the data frame does not exist on said transmission path; and

a transmitting portion for transmitting the data frame, and

when received one or more data frames, detecting, by said
10 carrier detecting portion provided therein, that the carrier does not exist on said transmission path to confirm that said transmission path is available, and then transmitting one or more data frames in sequence.

18. A relay device for relaying data transmission from a first transmission device transmitting a data frame to a second transmission device by using a single transmission path, comprising:

5 a receiving portion for receiving the data frame;

a carrier detecting portion for detecting that a carrier used for signal transmission of the data frame does not

exist on said transmission path;

10 an error detecting portion for detecting an error in
the data frame received by said receiving portion;

 a received frame analyzing portion for setting only
the data frame in which no error was detected by said error
detecting portion as a data frame to be transmitted; and

15 a transmitting portion for transmitting said data
frame to be transmitted, and

 when received one or more data frames transmitted from said
first transmission device, detecting, by said carrier detecting
portion, that the carrier does not exist on said transmission path
20 to confirm that said transmission path is available, and then
transmitting one or more of said data frames to be transmitted
to said second transmission device in sequence.

19. A transmission device for transmitting/receiving a
data frame including a transmission timer value indicating a total
frame time of data frames subsequent thereto by using a single
transmission path, comprising:

5 a receiving portion for receiving the data frame
including said transmission timer value;

 a transmission timer acquiring portion for acquiring
the transmission timer value included in the data frame received
by said receiving portion;

10 a transmission timer for suspending transmission for

a frame time indicated by the transmission timer value acquired by said transmission timer acquiring portion, and when none of said timer values is acquired, suspending transmission for a time indicated by a predetermined initial value;

15 a transmitting frame constructing portion for constructing a data frame to be transmitted including the transmission timer value so set as to indicate the total frame time of the data frames subsequent thereto; and

20 a transmitting portion for transmitting the data frame to be transmitted constructed by said transmitting frame constructing portion, and

25 when received one or more data frames, confirming, by said transmission timer, that said transmission path is available through an elapse of the time of suspending transmission, and then transmitting one or more of the data frames to be transmitted constructed by said transmitting frame constructing portion in sequence.

20. The transmission device according to claim 19, wherein

 said initial value is determined as the maximum time required for error-free transmission of all of said data frames.

21. A relay device for relaying data transmission from a first transmission device transmitting a data frame including

a transmission timer value indicating a total frame time of data frames subsequent thereto, to a second transmission device by
5 using a single transmission path, comprising:

a receiving portion for receiving the data frame including said transmission timer value;

an error detecting portion for detecting an error in the data frame received by said receiving portion;

10 a received frame analyzing portion for setting only the data frame in which no error was detected by said error detecting portion as a data frame to be transmitted;

a transmission timer acquiring portion for acquiring the transmission timer value included in the data frame received
15 by said receiving portion;

a transmission timer for suspending transmission for a frame time indicated by the transmission timer value acquired by said transmission timer acquiring portion;

a transmitting frame constructing portion for
20 constructing a data frame to be transmitted including the transmission timer value so set as to indicate the total frame time of the data frames subsequent thereto; and

a transmitting portion for transmitting the data frame to be transmitted constructed by said transmitting frame
25 constructing portion, and

when received one or more data frames transmitted from said first transmission device, confirming, by said transmission timer,

